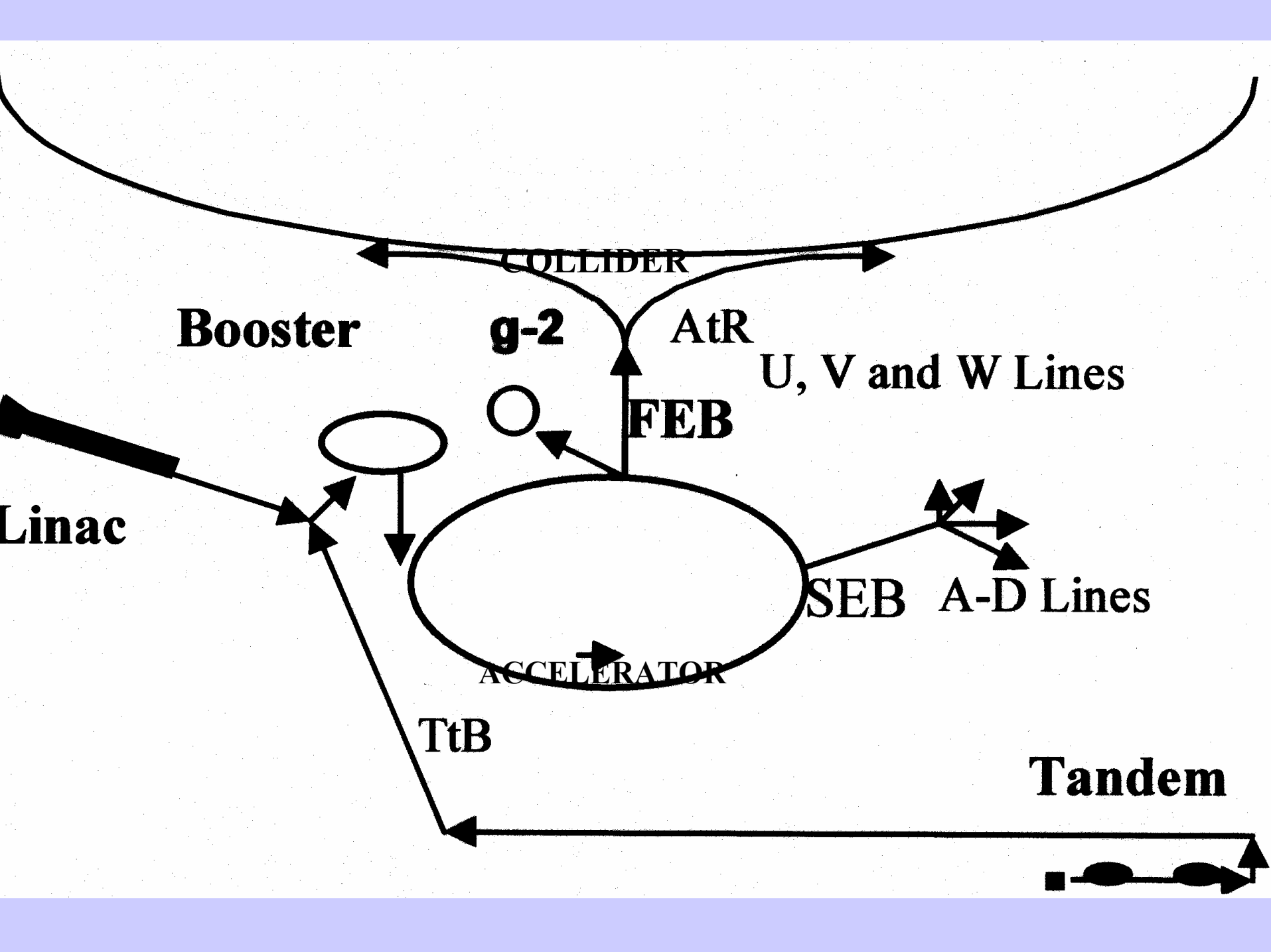


C-A Access Training

Year 2003





LEARNING OBJECTIVES

or

WHY TAKE THIS COURSE?

- Unescorted access into Accelerator primary areas
- Unescorted access into Collider tunnel and experimental areas.
- Requirements for entry into these areas.
- Response to emergencies.
- Successful completion of this course does not allow you to work in Contamination areas, remove activated materials and place them in uncontrolled areas without the assistance of Radiological Control Technicians (RCTs), or working on electrical equipment without additional laboratory training.



**No Bare Metal
Handling**

Use Gloves

Use Safety Shoes

**Contact ESH
Coordinator x 4617
to work with lead**

DANGER

**EXPLOSIVE GAS IN
USE**

**NO IGNITION
SOURCES**

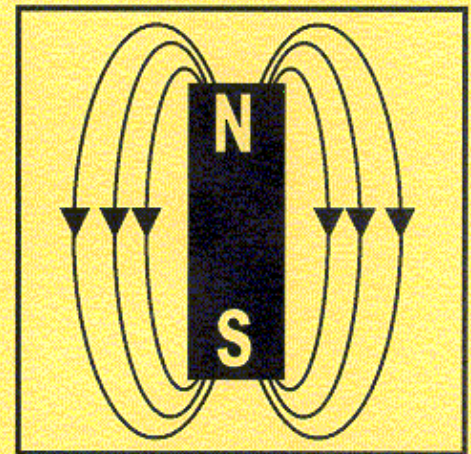


CAUTION

MAGNETIC FIELD HAZARD

FIELDS $\geq 0.5 \text{ mT}$ (5 G)

- **MEDICAL EVALUATION AND TRAINING FOR USERS OF**
 - * **CARDIAC PACEMAKERS**
 - * **ELECTRONIC MEDICAL IMPLANTS**



SEE ES&H COORDINATOR FOR DETAILS

STAR MAGNET



500 GAUSS FIELD

CAUTION

NOISE AREA

**LEVELS TO 90 dBA WITH EQUIPMENT ON
EAR PROTECTION REQUIRED
FOR OCCUPANCY > 5 MINUTES**

ELECTRICAL SAFETY TRAINING

If you work on electrical circuits that are powered through circuit breakers, disconnect switches and/or fuses, then you must LOTO the circuits. OSHA, BNL and C-A require that all workers performing these tasks be trained.

The C-A has three courses covering electrical safety that you may be required to take and pass:

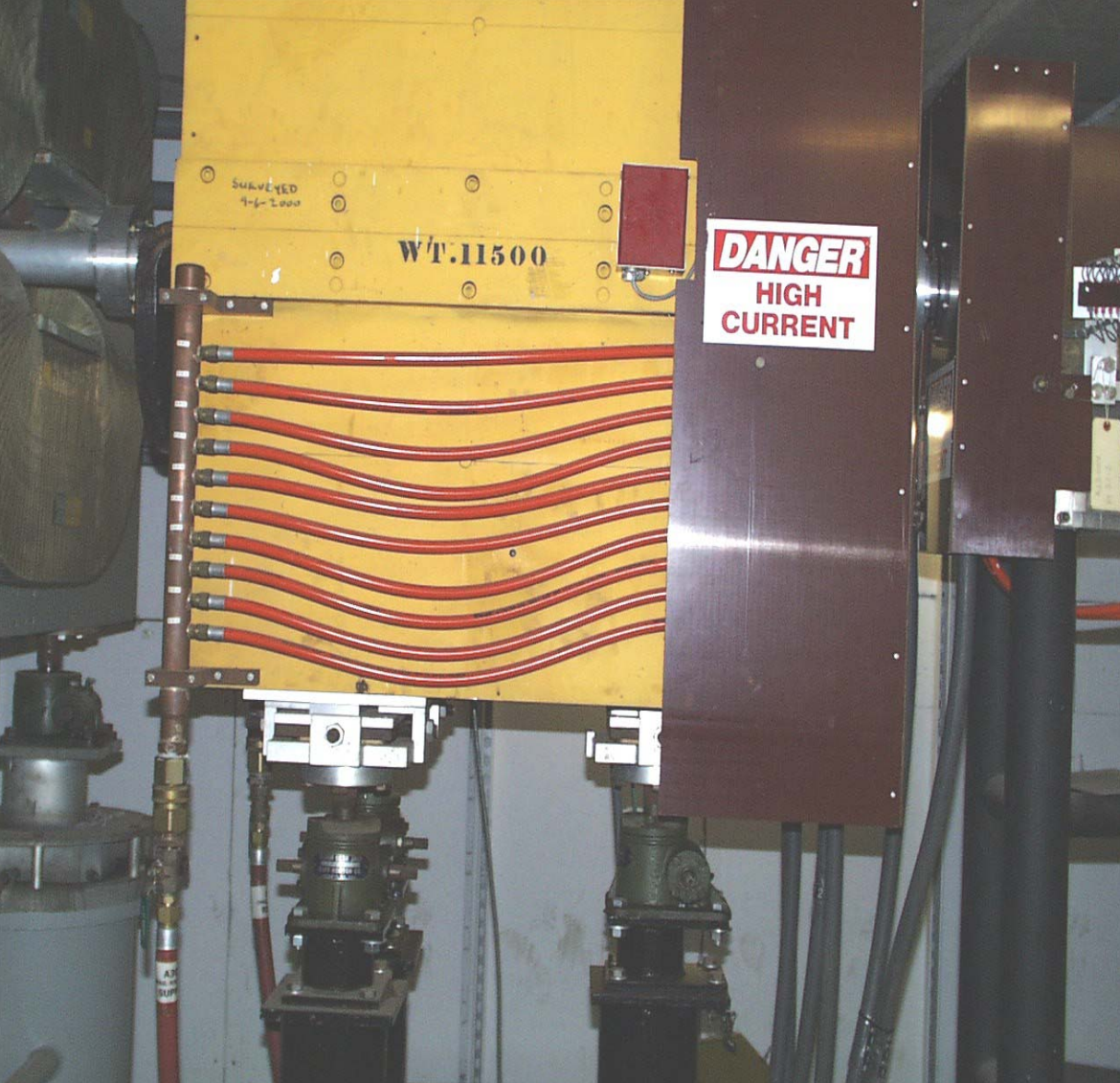
Electrical Safety

Lockout/ Tagout

Working Hot

Lockout/ tagout and Working Hot are required if you plan to work with:

- AC voltages greater than 50 Vac
- DC voltages greater than or equal to 50 Vdc
- Systems with greater than 10 ma of available current or capable of releasing 10 joules or more of energy instantaneously.



**PONTENTIAL FOR ELECTRICAL SHOCK
HAZARD**

ELECTRICAL SAFETY IN PRIMARY AREAS

- A single senior individual at C-A is responsible for the TOKEN BOX, and he will be the first to place a lock and electrical safety red-tag on the TOKEN BOX and the last to remove it.
- After his LOTO is placed on the TOKEN BOX, **EACH WORKER ENTERING A RING MAY BE** required to place **THEIR OWN LOCK** AND TAG on the box as well
- The need for locking and tagging the box by each entrant **DEPENDS ON THE WORK** they are to perform.
- Walk-through of the area where beam line **EQUIPMENT IS NOT TOUCHED** does not require a Radiation Worker to add their own lock and tag.





LOTOTO

USE FOR PERSONNEL PROTECTION

HOLD DANGER

DATE _____ TAG NO. 66731
TIME _____
APPARATUS _____

WRITE REASON IN SPACE BELOW

DO NOT USE, MOVE OR OPERATE
WHILE THIS TAG IS ATTACHED

TAG ATTACHED BY
AND MAY BE REMOVED ONLY BY

PRINT NAME _____ DEPT. _____ EXTENSION _____

RETURN TAG TO ISSUING
OFFICE WHEN NO LONGER REQUIRED

TAG NO. 66731 DATE _____
HAS BEEN ATTACHED TO _____

BECAUSE _____

SIGNED _____

RETURN STUB TO ISSUING OFFICE

BNL F 2791A

Radiation Lock Out / Tag Out



To sign out CAT 24 Key to work in the Security Terminal Room, you must be Working Hot trained.

SECURITY SYSTEM ORANGE TAGS



Program disruption will occur by overlooking an orange tag

Electric shock hazard possible since most of system is 120 V

USE FOR EQUIPMENT PROTECTION

TAG NO. 1785

DATE _____

APPARATUS _____

DO NOT OPERATE

THIS DEVICE SHALL NOT BE OPERATED BY ANY ONE
OTHER THAN THOSE DESIGNATED BY:

(SUPERVISORS OR FOREMEN)

UNAUTHORIZED OPERATORS ARE
SUBJECT TO DISCIPLINARY ACTION

(OVER)

CAUTION

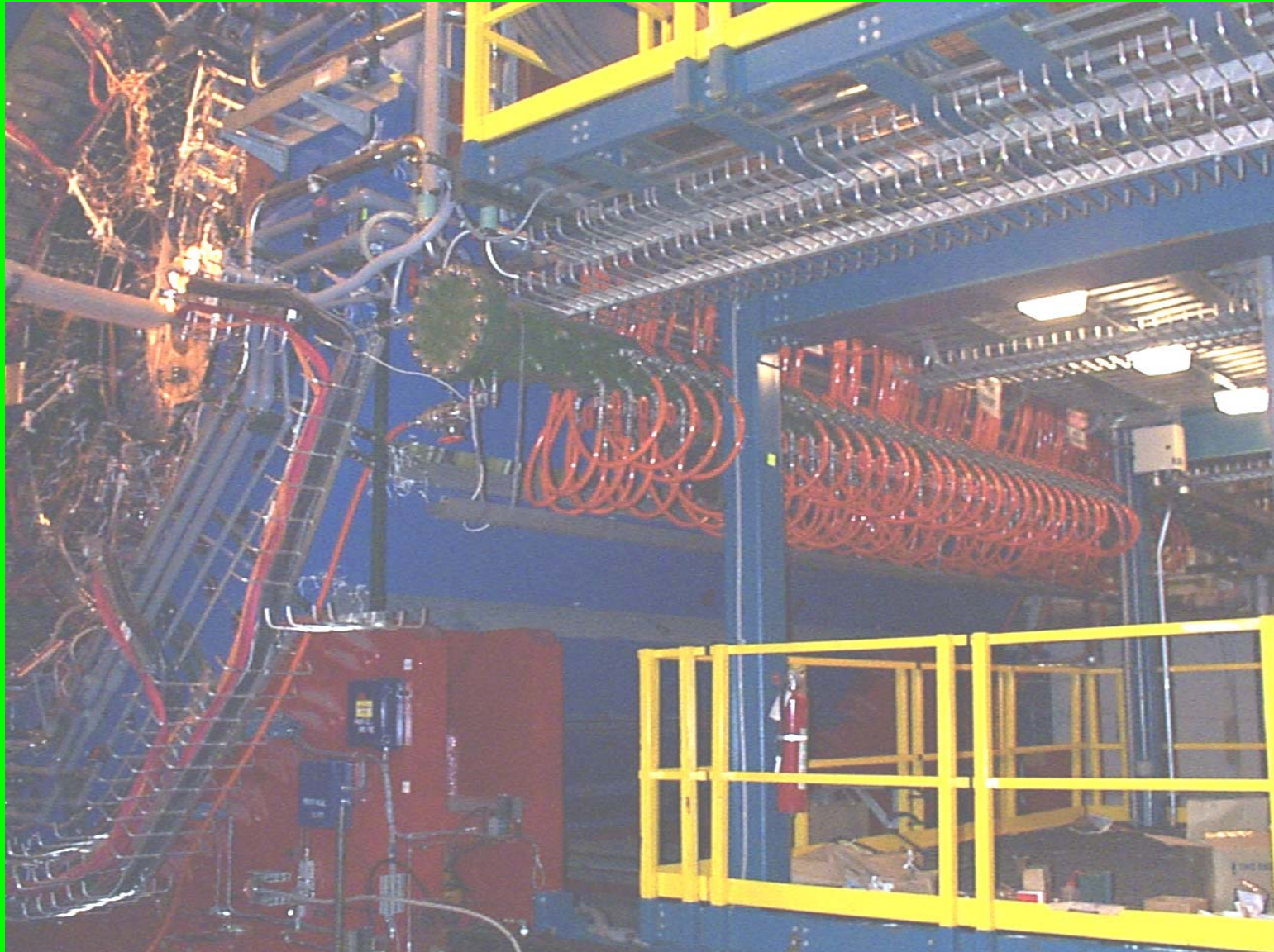
DO NOT OPERATE

PROGRAMMATICAL LOSS
OR
EQUIPMENT DAMAGE
POSSIBLE

SEE OTHER SIDE.

STONEHOUSE SIGNS, Inc., Denver, CO
TAG NO. 2587-G

STAR MAGNET COOLING SYSTEM



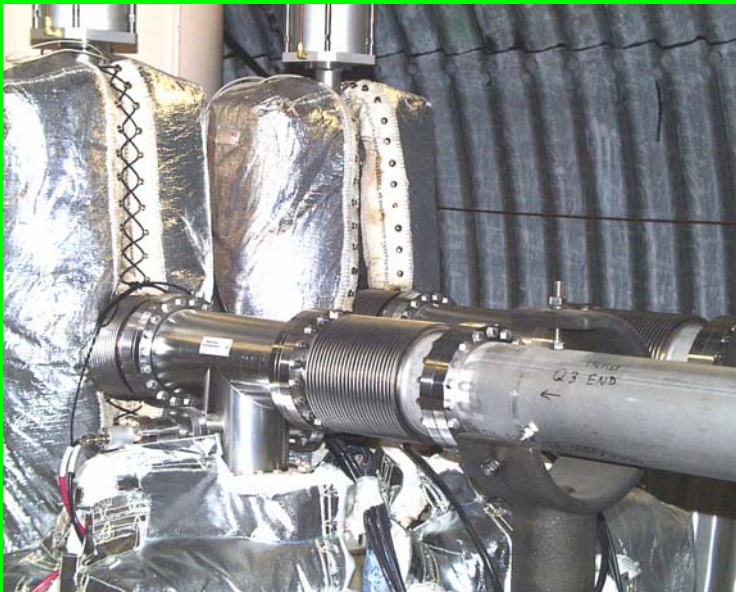
POWER SUPPLY/EQUIPMENT ROOM AT STAR



TRIP HAZARDS AT STAR



BEAM PIPES



LASERS



PIPING ELECTRICAL, WATER, CRYOGENIC



Hardhat Policy



Required at construction areas .

When people are working overhead

When overhead cranes are handling objects

Material Safety Data Sheets - MSDS

- Name of Chemical
- Manufacturer
- Hazardous Ingredients
- Physical Characteristics
- Fire and Explosion Data
- Reactivity Data
- Health Hazard Data
- Safe Handling Data
- Safety Control Measures

CONTACT ES&H COORDINATOR FOR
INFORMATION (x 7200)

Compliance with Price Anderson Amendments Act (PAAA)

- Failure to comply with radiological rules, or to identify and report radiological non-compliance to DOE , subjects the Laboratory to enforcement action.
- Worker Responsibilities include:
 - Comply with requirements
 - Report non-compliance, how ever small
 - Obey Radiological Stop Work Order

WARNING

Willful or flagrant disregard of Federal Radiation Protection Rules may results in disciplinary action.

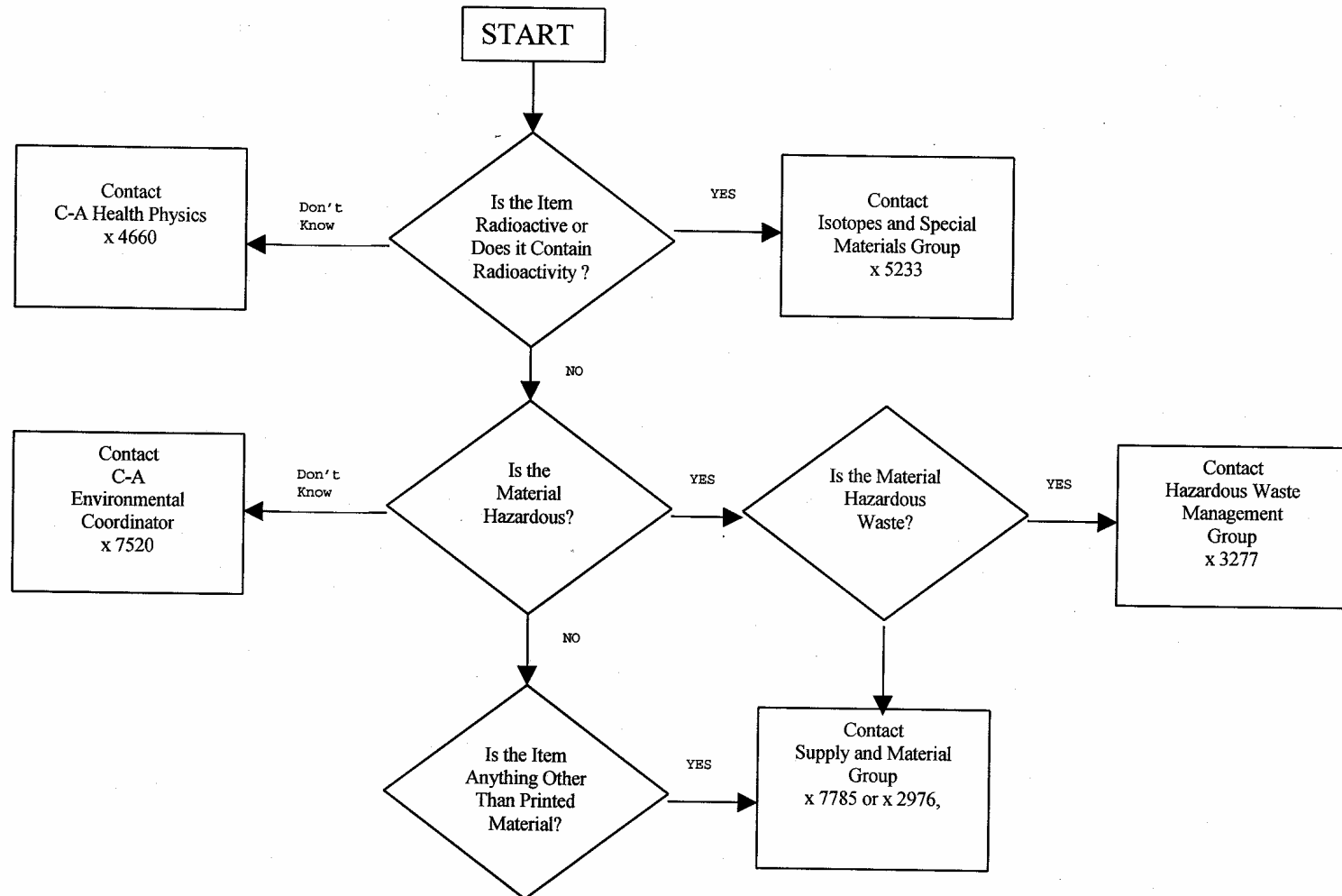
Single Point Delivery at the C-A Complex

All persons, including delivery people, who enter Radiation Areas either must be escorted by a trained Radiation Worker or they must be a Radiation Worker.

In order to ensure that delivery people do not wander into Radiation Areas, All deliveries are to be made to non-radiological areas of the complex.

- Deliveries can be made to Building 100
- Deliveries for off hours can be made to the Main Control Room (x 4662)

IF YOU ARE SHIPPING FROM C-A TO OFF SITE, THEN ASK YOURSELF THESE QUESTIONS



RADIOLOGICAL AREA DEFINITIONS

Controlled Area -- any area where access is controlled due to the presence of radiation above natural background levels or due to the presence of man-made radioactive materials. As a minimum, these areas are posted “Controlled Area.”

Radiation Area -- any accessible area where an individual may receive a whole-body dose greater than 5 mrem in one hour at 30 cm (1 ft). As a minimum, these areas are posted “Radiation Area, TLD Badge Required.”

High Radiation Area -- any accessible area where an individual may receive a whole-body dose greater than 100 mrem in one hour at 30 cm (1 ft). As a minimum, these areas are posted “Danger, High Radiation Area, TLD Badge and SRD Required.”

DANGER



**HIGH RADIATION
AREA**

WITH BEAM ON

ENTRY REQUIREMENTS

**TLD AND RWP
SUPPLEMENTAL DOSIMETER
CONTACT MCR x4662**

PRIMARY BEAM

100,000,000,000 rem/hr

(for proton beam)

Faults No more than 20 mrem
per fault out side shield.

Normal Operations 1 to 2 mrem
in experimental areas.

Residual activity inside primary
areas up to several 10's of rems
in spots.

Other- Air activation, cooling
water, activated soil near beam
stops.

ACTIVATION CHECK REQUIRED

RADIOACTIVE MATERIALS AREA



This posting means you must not release items from the area without checking for activation.

Contact the HP office to perform activation check.

RADIATION LEVELS FOLLOWING HIGH- INTENSITY PROTON RUNNING

| AREA | LOCATION | ROUTINE RADIATION LEVEL, mrem/h |
|---------------------------------|---------------------------------------|--|
| Linac | BLIP Y | 500 to 1000 |
| | Booster Interface | 500 |
| Booster | Inside of Ring | 10 to 200 |
| | Outside | 1 to 100 |
| | Extraction Area | 200 plus |
| Accelerator Ring | Inside of Ring | 100 to 10,000 |
| | Outside | 1 to 1000 |
| | Extraction Area | 10,000 |
| RHIC* | Collider Tunnel | < 5 |
| Switchyard and Beam Lines | Near Center of Magnet Gaps | 10 to 10,000 |
| Target Caves | Inner Gate | 100 to 2000 |
| | A-D Targets | 50,000 |
| | V Target One Week Post Shutdown | 300,000 |

C-A ADMINISTRATIVE DOSE LIMITS

| Period of Interest | Maximum Individual Dose Limit mrem | Individual Dose Limit With Line Authority Approvals mrem |
|--------------------|---|--|
| Calendar Year | 1000 | 1000 to 1250 (C-A Chair Approval) 1250 to 2000 (Lab Director Approval) |
| Day | 100 | 100 to 200 (Approval authority will be on RWP) |
| Lifetime | N rem Where Age Of Person in Years | Laboratory Director Approval to exceed N rem |

C-A ADMINISTRATIVE LIMITS FOR VISITORS, UNTRAINED STAFF, AND MINORS

Untrained visitor, untrained User, or untrained staff has a dose limit of 25 mrem per year. A limit of 100 mrem per year is allowed with written permission from C-A Associate Chair for Safety and concurrence of Radiological Control Division.

Minor (< 18 years) dose limit is 25 mrem per year and parental consent is required. Minors are not allowed to work in radiological areas but are allowed to visit or tour radiological areas.

ACUTE RADIATION SYNDROME

The following will result from receiving a large dose over the whole body in less than one day:

- 25 rad - temporary blood changes that can be detected by a physician using appropriate instruments.
- 150-200 rad - observable symptoms such as diarrhea, vomiting, nausea, fatigue, and hair loss.
- 450 rad - lethal dose to 50% of exposed population within 30 days if medical attention is not given to fight infections.

EMERGENCY DOSE FOR RESCUE OR RECOVERY

All persons must follow the instructions of the Department Emergency Coordinator (DEC) who is the Operation Coordinator during operation. During shutdown and maintenance periods, the C-A ESH&Q Division Head is the DEC. IF an emergency requires rescue of personnel and involves substantial risk, THEN volunteers may be selected based on their age, experience, and prior dose history. These rescues are to be pre-planned activities and are not to be “heroic efforts to save a friend.” The DOE and BNL emergency dose limits are:

- 10 rem for protecting major property where the lower dose limit of 5 rem is not practical.
- 25 rem for life saving or protection of large populations where the lower dose limit is not practical.
- 25 rem or greater is allowed only on a voluntary basis and only when a person is fully aware of the risks involved.

ALARA PHILOSOPHY

RADIATION EXPOSURE MUST :

Have A Net Benefit

Be AS LOW AS REASONABLY ACHIEVABLE

Be Within Limits.

Basic ALARA strategy on the part of the worker revolves around effective use of Time, Distance and Shielding.

ALARA may also be incorporated into design and operations.

The following are examples of ALARA Strategies

- Track and reduce unnecessary beam loss
- Design and add temporary shielding
- Hold discussions in areas where radiation level is the lowest
- Use remote handling equipment, use mirrors and video cameras
- Use portable power tools
- Plan work and practice, assemble parts out of the area
- Install quick disconnects
- Install radiation resistant devices
- Identify lower dose rate areas

RADIATION WORK PERMITS (RWP)

- Radiation Work Permits apply to specific individuals for all jobs in Radiation, High Radiation, and Contamination Areas.
- All Jobs in a Radiation Area predicted to cause greater than 20 mrem to an individual shall require a RWP.
- All Jobs in a Radiation Area predicted to cause greater than 200 person-mrem to a work crew shall require a RWP.
- Persons named on the RWP must read and sign that they are aware of the requirements.

**Brookhaven National Laboratory
RADIOLOGICAL WORK PERMIT**

RWP # 02-01

Start Date: September 1, 2002

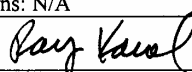
☐ Job Specific

☒ Standing /General

End Date: July 31, 2003

Shaded areas 1 through 8 to be completed by requestor/initiator)

Revised End Date:

| | | | | |
|---|---|---|--|--------------|
| 1. Initiator: Raymond Karol | | 2. Life #:15065 | 3. Phone: 5272 | 4. Bldg: 911 |
| 5. Job Location(s): Posted Radiation Areas at the Collider-Accelerator Department See SI(1) | | | | |
| 6. Job Description (Attach sheets as needed): <i>Routine Entry for Inspections, Data Collection, Tours, or Routine Work Activities Performed by a System Specialist.</i> | | | | |
| 6a. Work Begins: 09-01-02 | | 6b. Work Ends: 07-31-03 | | |
| 7. Historical/Other Concerns: N/A | | | | |
| 8. Signature of Initiator: Ray Karol 07-31-02  | | | | |
| 9. Conditions that will void RWP: None | | | | |
| 10. Job Review: <input checked="" type="checkbox"/> Pre-Job Review <input checked="" type="checkbox"/> Pre-Job Briefing Work Control Coordinator to Consult with Building Manager and /or Supervisor when Assigning Tasks | 11. Estimated Dose: Highest Individual: <u>20</u> mRem <input checked="" type="checkbox"/> Per Entry Collective: <u>200</u> mRem <input checked="" type="checkbox"/> Per Job <p align="center">See SI (2)</p> | 12. Attachments: <input checked="" type="checkbox"/> Radiological Survey Form <input checked="" type="checkbox"/> Other: <u>Pre-Job Review</u> <u>C-A OPM-ATT 9.5.4a</u> | 13. Training Requirements: <input checked="" type="checkbox"/> Radiation Worker I (RWT 002) <input checked="" type="checkbox"/> C-A Facility Specific Training, (Access, Fixed Target, or Collider Users) in addition to Radiation Worker I. <input checked="" type="checkbox"/> Other: Entry into U-Line requires C-A Access or C-A Fixed Target Training in addition to Radiation Worker I. <p align="center">See SI(3)</p> | |
| 14. Work Controls: <input checked="" type="checkbox"/> Hold Points See SI (4) <input checked="" type="checkbox"/> Limiting Conditions See SI (5) <input checked="" type="checkbox"/> Other: See SI (6) | 15. Protective Equipment: <input checked="" type="checkbox"/> Not Applicable | 16. Dosimetry: <input checked="" type="checkbox"/> TLD | 17. Check Out Instructions: <p align="center">Many Locations Require Activation Checks Prior to Removing Items from Area. Read and Follow All Postings.</p> | |
| 18. Special Instructions (SI): (Including Facility Specific Training) (1) Refer to C-A OPM-ATT 9.5.4a for a listing of permanent Radiation Areas. Due to the transient nature of many Radiation Areas at C-A there will be some that may not be listed on this attachment but may be covered under this RWP. <u>Read and follow all postings.</u> (2) No single entry shall result in more than 20 mR. Multiple entries shall not result in more than 20 mR per person per job. If pre-job dose estimates exceed 20 mR per person or 200 mR collective a Job-Specific RWP is required. (3) Visitors may be escorted by a trained and authorized C-A escort in accordance with C-A OPM 2.16. (4) Consult with Facility Support Staff prior to starting any job in the U-line Neutrino Blockhouse. (5) This RWP is not for work in Radiation Fields > 100 mR hr ⁻¹ , Handling or exposure to tritiated water, Unapproved alterations of radiation barriers, or for work with the potential to disperse or generate radioactive contamination such as Cutting, Grinding, and Drilling. (6) Review appropriate radiological survey prior to commencing work. The sign-in log for this RWP is located in the 911A Training Office, and the Health Physics Field Office after normal working hours. | | | | |

TLD BADGE RULES

Wear TLD on torso between neck ad waste.



Return TLD to low background area



All TLDs have neutron badges, some have extra neutron packs

TLD BADGES FOR VISITORS

- Visitors are those persons who are Visiting-They are not expected to work
- A Red-Stripe TLD is issued to Visitors for a limited period AND cannot be re-issued
- An Escort is required at all times for Red-Stripe TLD visitors



SELF READING DOSIMETER (SRD)



- Digital SRDs are required in High Radiation Areas



- Efficient for Gamma dose

ABNORMAL RADIATION LEVELS

If you encounter the following then **STOP WORK**, alert your supervisor and contact Health Physics (x4660) as soon as possible.

- Radiation Levels not anticipated on your RWP
- Unexpected high or full-scale dosimeter readings
- lost or misplaced TLD

WORK REQUIREMENTS FOR CONTAMINATION AREAS

- RWP required
- Only C-A RCT's may cover job
- You can be escorted by a trained Contamination worker in a Contamination Area
- You cannot be escorted into a High Contamination Area
- Frisk at rate of 1 cm/second
- Check all removed items for contamination

MATERIALS THAT MAY CAUSE CONTAMINATION IN C-A RADIOLOGICAL AREAS

- Leaking water from magnet cooling systems
- Drilling or grinding of materials in radiological areas
- Breaking of fragile or fine wires or materials
- Vermiculite in fire stops on cable trays
- Leaking oil from vacuum systems
- Discharge of fire extinguisher contents

Labels For Shielding

Green is less than 5 mrem/hr

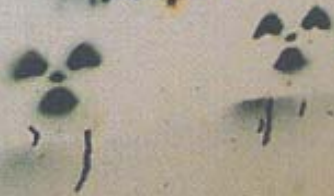
Yellow is less than 100 mrem/hr

Red is greater than 100 mrem/hr

RADIOACTIVE
MATERIAL



RADIOACTIVE
MATERIAL



**The ends of lead bricks,
and small concrete or
steel block are painted
with the appropriate color**

RADIOACTIVE
MATERIAL



RADIOACTIVE
MATERIAL



Health Physics does a good job at posting radiation level signs. However never assume postings is perfect. Postings can fall off. Postings can be missed or be inappropriate because radiation sources can come and go.



DO NOT CLIMB OR DEFEAT BARRIERS

RADIATION SOURCES

Have sources inventoried by the C-A Health Physics
Complete the source inventory form. Keep the form with the source
in the source box



DO NOT LOITER AROUND SOURCE STORAGE BOXES

CHIPMUNKS AREA RADIATION MONITORS



SET UP LIKE STOP LIGHTS

RED BLINKING LIGHT FOR GREATER THAN 20mrem/hr

YELLOW BLINKING FOR GREATER THAN 2 mrem/hr

DATA IS STORED AND CAN BE USED TO ESTIMATE DOSE

INTERLOCKS AT HIGH DOSE

PARTICLE ACCELERATOR SAFETY SYSTEM (COLLIDER)

ACCESS CONTROL SYSTEM (ACCELERATOR)

ACCESS PROHIBITED



BEAM DISABLED



CONTROLLED ACCESS



RESTRICTED ACCESS

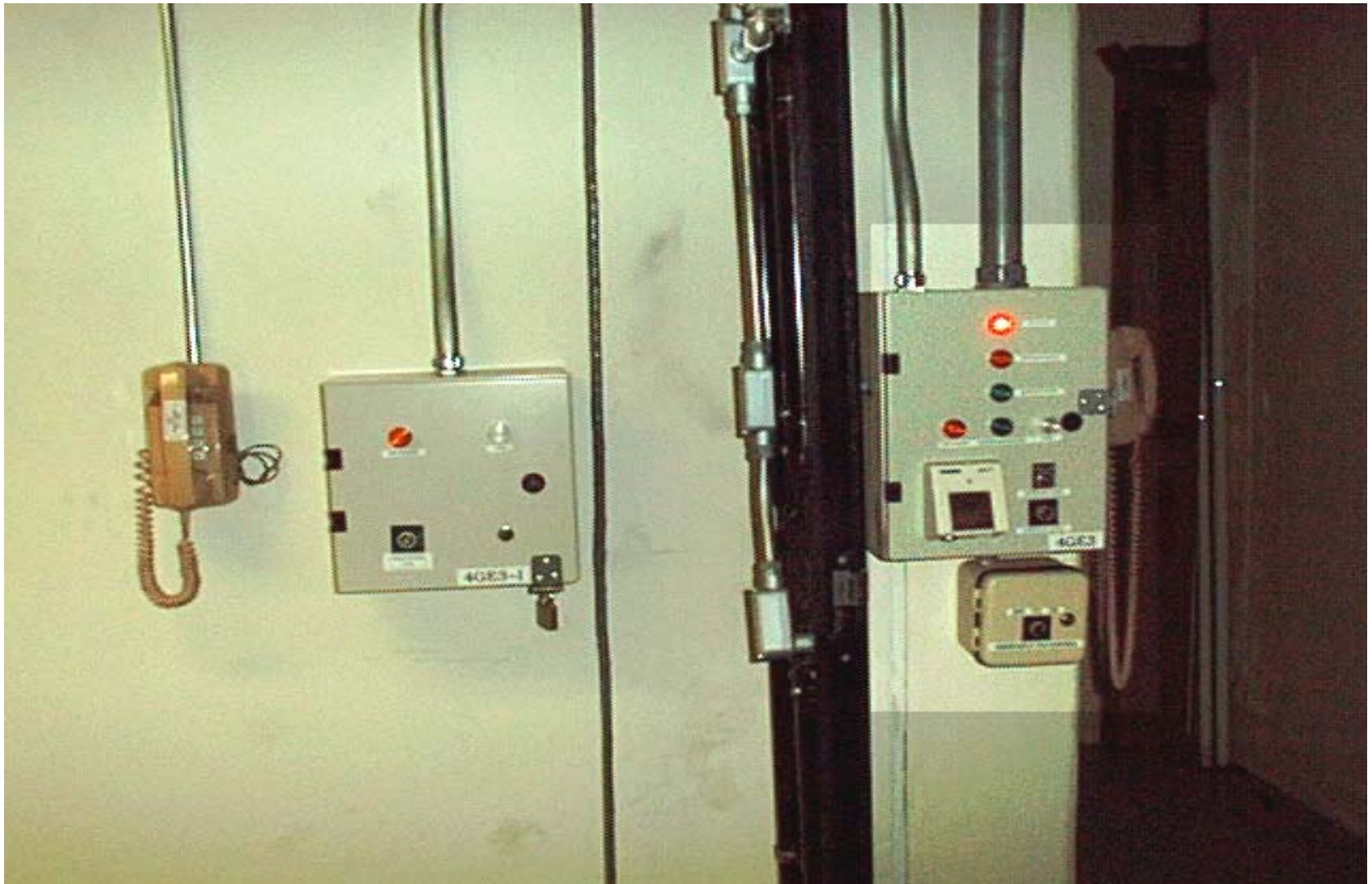
ACCESS CONTROL SYSTEM

- Designed for Radiation Protection
- 0 or 256 key used during Restricted Access
- One Key One Access ! NO TAIL GATING

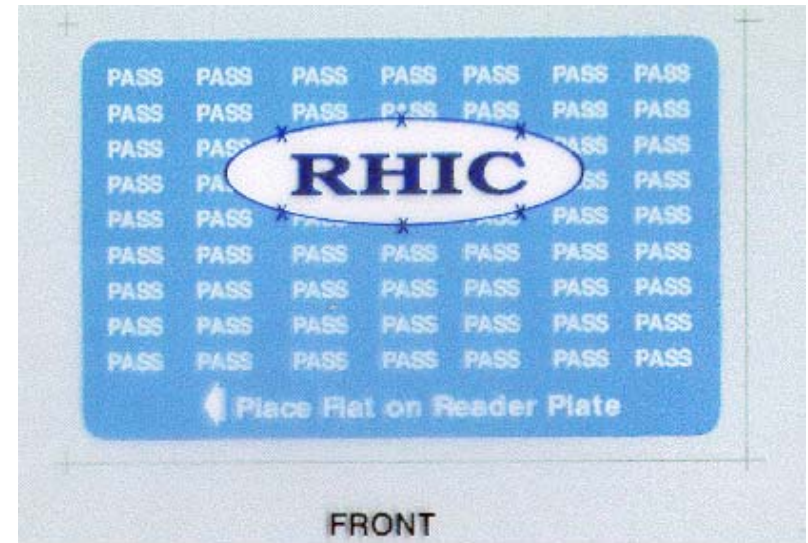
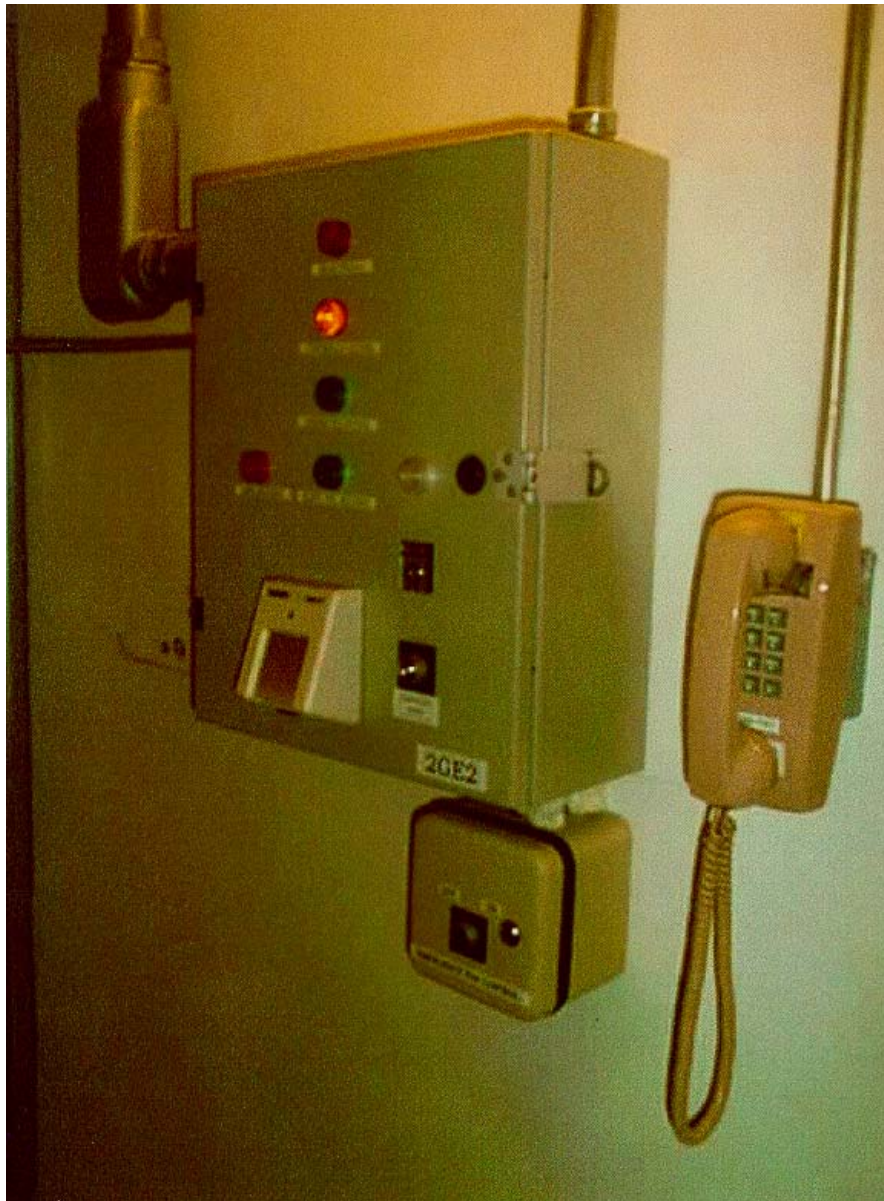
PASS

- Designed for Radiation Protection
- Designed for ODH Protection
- Card used during Restricted Access
- One Card One Access! NO TAIL GATING

ENTRY AND EXIT GATE BOXES AT THE COLLIDER



PASS CARD READER



ENTRY MODES & STATUS INDICATORS

RED LIGHT- NO ACCESS

This mode means that the beam or RF is about to be, or is present in the enclosure

ENTRY MODES & STATUS LIGHTS

YELLOW LIGHT- CONTROLLED ACCESS

CA Key & MCR Supervision Required

Confirmed by Shift Leaders to Access Experiments.

Get Key from MCR Keytree.

Call MCR from Access Gate, be observed by video, a tone will sound , open Gate.

Yellow Exit Light means MCR must open gate to Exit.

Call MCR and Wait to hear buzzer.

ENTRY MODE & STATUS INDICATORS

GREEN LIGHT- RESTRICTED ACCESS

To Enter place card on reader, get green light on reader, open door.

To exit turn knob on door.

Controlled Access

Most electrical systems turned off and a few systems have LOTO

One person stands gate watch at a single gate

Enter and exit through the same gate

Sign in and sign out on gate log

**MCR Operator Sweep Is Used To
Go From Restricted Access To
Controlled Access**



C-A RWP ACCESS CONTROL LOG



Provides radiation workers with a method to review tasks and task pre-requisites before starting work in these areas.

Signature and dose information required to fulfill RWP requirements.

PRIOR TO ENTERING A CONTAMINATION AREA OR HIGH RADIATION AREA, YOU MUST COMPLETE THE FOLLOWING:

- 1) CONTAMINATION AND HIGH RADIATION SIGN-IN LOG.
- 2) GATE WATCH LOG IF AREA IS UNDER CONTROLLED ACCESS.

**UPON EXITING THE AREA YOU MUST ENTER YOUR
DIGITAL DOSIMETER READING ON THE SIGN-IN
LOG.**

**IT IS A SERIOUS VIOLATION TO LEAVE
BLANK SPACES ON THE LOG SHEET**

Restricted Access

- 0 Key and 256 Key Apply
- ~100 Electrical Systems on LOTO
- RW1 and Ring & Cave Training Required
- RWP Required if Primary Area is HRA
- Radiation Survey at Onset of Restricted Access
- Escorting ONLY by Trained Escorts

GATES ARE LOCKED AND EXIST FOR RADIATION & ODH PROTECTION



- You are the person most responsible for your safety. Use common sense. Never assume you know all the hazards.
- DO NOT attempt to enter primary areas immediately following a power failure; CONTACT MCR FIRST.
- Follow POSTINGS activation checks required in most areas.
- DO NOT tamper with Access Gates or other Access System components.

BEAM IMMINENT ALARM TO ENSURE NO OCCUPANCY

Overhead light go off,
Audible Announcement.



Orange Strobe light,
Audible Announcement



Orange Strobe Light,
Alarm Sounds

Work Order # _____ Job # _____ Activity # _____
1. *Work requester fills out this section* **STANDING WORK PERMIT** ☐

Requester: _____ Date: _____ Ext. _____ Dept/Div/Group: _____
Other Contact person (if different from requester): _____ Ext. _____
Work Control Coordinator _____ Start Date _____ Est. End Date _____
Description of Work / Problem: _____

Building _____ Room _____ Equipment _____ Service Provider _____

2. *Work requester, service provider, and ES&H (as necessary) fill out this section or attach analysis*

ES&H Analysis
RADIATION CONCERNS ☐ NONE ☐ Activation ☐ Airborne ☐ Contamination ☐ Radiation ☐ OTHER _____
☐ Special nuclear materials involved, notify Isotope Special Materials Group ☐ Fissionable materials involved, notify Laboratory Criticality Officer
SAFETY CONCERNS ☐ NONE
☐ Adding / Removing ☐ Confined Space* ☐ Explosives ☐ Lead* ☐ Penetrating Fire Wall
☐ Walls or Roofs ☐ Corrosive ☐ Flammable ☐ Magnetic Field ☐ Pressurized Systems
☐ Asbestos* ☐ Cryogenic ☐ Fumes/Mist/Dust* ☐ Material Handling ☐ Rigging/Critical Lift
☐ Beryllium* ☐ Electrical ☐ Heat/Cold Stress* ☐ Noise* ☐ Toxic Materials*
☐ Biohazard* ☐ Elevated Work* ☐ Hydraulic ☐ Non-ionizing Radiation ☐ Vacuum
☐ Chemicals* ☐ Excavation ☐ Lasers* ☐ Oxygen Deficiency* ☐ OTHER _____
*Does this work require medical clearance or surveillance from the Occupational Medicine Clinic? ☐ Yes ☐ No

ENVIRONMENTAL CONCERNS ☐ NONE
☐ Atmospheric Discharges (rad/non-rad) ☐ Liquid Discharges ☐ Work impacts Environmental Permit No. _____
☐ Chemical or Rad Material Storage or Use ☐ Oil / PCB Management ☐ Soil activation/contamination ☐ Waste - Mixed
☐ Cesspools (UIC) ☐ Protected areas / species ☐ Waste - Clean ☐ Waste - Radioactive
☐ High water / power consumption ☐ Spill potential ☐ Waste - Hazardous ☐ Waste - Regulated Medical
☐ Waste - Industrial ☐ OTHER _____
Waste disposition by: _____

POLLUTION PREVENTION (P2) / WASTE MINIMIZATION OPPORTUNITY: ☐ None ☐ Yes
Facility Concerns ☐ NONE
☐ Access/Egress Limitations ☐ Impacts Facility Use Agreement ☐ Temperature Change ☐ OTHER _____
☐ Configuration Control ☐ Maintenance Work on Ventilation Systems ☐ Utility Interruptions
☐ Electrical Noise ☐ Potential to Cause a False Alarm ☐ Vibrations

Work Controls
WORK ☐ NONE ☐ Exhaust Ventilation ☐ Lockout/Tagout ☐ Spill Containment
PRACTICES ☐ Back-up Person/Watch ☐ HP Coverage ☐ Posting/Warning Signs ☐ Time Limitation
☐ Barricades ☐ IH Survey ☐ Scaffolding - requires inspection ☐ Warning alarm (i.e. "high level")
PROTECTIVE EQUIPMENT ☐ NONE ☐ Ear Plugs ☐ Gloves ☐ Lab Coat ☐ Safety Glasses
☐ Coveralls ☐ Ear Muffs ☐ Goggles ☐ Respirator ☐ Safety Harness
☐ Disposable Clothing ☐ Face Shield ☐ Hard Hat ☐ Shoe covers ☐ Safety Shoes ☐ OTHER _____
PERMITS *Initial next to box to show who has responsibility to generate the permit. *Permits must be valid when job is scheduled.*
RE-REQUIRED ☐ NONE ☐ Cutting/Welding ☐ Impair Fire Protection Systems
(Please attach) ☐ Concrete/Masonry Penetration ☐ Digging/Core Drilling ☐ Rad Work Permit - RWP No. _____
☐ Confined Space Entry ☐ Electrical Working Hot ☐ OTHER _____
DOSIMETRY/ MONITORING ☐ NONE ☐ Heat Stress Monitor ☐ Real Time Monitor ☐ TLD
☐ Air Effluent ☐ Noise Survey/Dosimeter ☐ Self-reading Pencil Dosimeter ☐ Waste Characterization
☐ Ground Water ☐ O₂/Combustible Gas ☐ Self-reading Digital Dosimeter ☐ OTHER _____
☐ Liquid Effluent ☐ Passive Vapor Monitor ☐ Sorbent Tube/Filter Pump

Training Requirements (List below any location specific training requirements)

Based on analysis above, the Walkdown Team determines the risk, complexity, and coordination ratings below.
ES&H Risk Level: ☐ LOW ☐ MODERATE ☐ HIGH
Complexity Level: ☐ LOW ☐ MODERATE ☐ HIGH
Work Coordination: ☐ LOW ☐ MODERATE ☐ HIGH
Note: If all the ratings are LOW, the Work Control Coordinator and Service Provider must sign for concurrence on the back side.
Further review of the work permit is not required. If any ratings are MODERATE or HIGH, the entire permit must be completed.

ENHANCED WORK PLANNING

Review of
conventional safety,
radiological safety,
Environmental
considerations, and
work coordination

IN-HOUSE WORK PLANNING AND SCREENING AT C-A

All internally initiated jobs at C-A must be screened for ES&H hazards. The hazards for C-A work planners who are involved in screening are as follows:

Low-Hazard (Skill of the Craft) Work: Work requiring the attention of the average performer to prevent minor injury. Failure to correctly perform low-hazard work would not damage equipment or structures or release potentially hazardous materials to the environment, except as a result of gross negligence.

Enhanced Work Permits Required for:

Moderate-Hazard Work: Work requiring coordinated actions to prevent any injury to personnel, minor damage to equipment or structures, or release of hazardous materials to the on-site environment.

High-Hazard Work: Work requiring coordinated actions to prevent serious injury to personnel, significant damage to equipment or structures, or releases of reportable quantities of potentially hazardous materials to the off-site environment.

C-A CONDUCT OF OPERATIONS

- On duty Operation Coordinator is responsible for the safe operation of accelerator complex.
- Maintenance Coordinator is responsible for safe operation and coordination during shut down periods.
- Definitive lines of authority
- Written procedures exist for most operations
- Use of qualified and trained personnel where required
- Appropriate authorizations and work permits required before beginning a job.

OXYGEN DEFICIENCY HAZARD TRAINING FOR CLASS 0 SPACES

CAUTION

**OXYGEN
DEFICIENCY
HAZARD**

0

Prior to entry, all personnel shall have:

- Oxygen deficiency hazard orientation**

WHAT IS OXYGEN DEFICIENCY

Normal atmospheric content is:

20.9% oxygen, 78% nitrogen, 1% argon

Oxygen deficiency is defined as $< 19.5\%$ oxygen

This happens when air in an enclosed space is displaced by another gas

WHAT CAUSES OXYGEN DEFICIENCY?

- Cryogenic systems use large amounts of helium and nitrogen.
- Both liquids expand about 700-800 times when released in air.
- This could happen quickly with a major release as a result of a catastrophic failure. A rapidly expanding, white cloud and possible “whooshing” sound.
- Could be slow, invisible and silent leak.
- Both gases are colorless and odorless.
- Tandem Van de Graaff uses SF₆ gas

CLASSIFICATION LEVELS OF ODH

- There are five classes: 0 through 4, with 0 being the least hazardous.
- Classification is based on the likelihood of fatality.
- There are no areas at the C-A complex with classification greater than 1 (1005R refrigerator, g-2 refrigerator.)
- Control measures are required for Class 1

CLASS 0 AREAS AT C-A COMPLEX

- g -2 Compressor building
- g-2 Muon Ring Storage Building (high bay)
- Buildings at RHIC with Valve Boxes
 - Support Buildings 1002B, 1004B, 1006B, 1008B
 - Service Buildings 1010A and 1012A
- Collider Ring
- Helium Compressor in Buildings 1005H and 1005E
- Tandem Van de Graaff (SF6)

CLASS 1 AREA AT RHIC

Class 1: Refrigerator building (1005R)

- Requires Additional Special Training
- Requires Medical Approval for entry
- Personal O₂ Monitor and Self-Rescue Escape Pack

EFFECTS OF OXYGEN DEFICIENCY


| Vol % O ₂ | Effect on Healthy Person | Approx Time |
|----------------------|---|-----------------------------|
| 17 | Deep breathing, Faster heartbeat | Rapidly |
| 16 | Dizziness, slower reaction time | |
| 15 | Impaired attention and coordination Intermittent Breathing Rapid Fatigue | |
| 12 | Very Faulty judgement Inability to move Loss of consciousness, brain damage | 10 min 10 min 2 hours |
| 10 | Inability to move, nausea, vomiting Loss of consciousness | 4 min 10 min |
| 6 | Loss of consciousness Coma Death | 30 sec 1 min 5 min |

WHEN IS EVACUATION REQUIRED?

When the in place oxygen monitors set off alarm.

At the COLLIDER -

Blue Strobe Light and Audible Alarm.



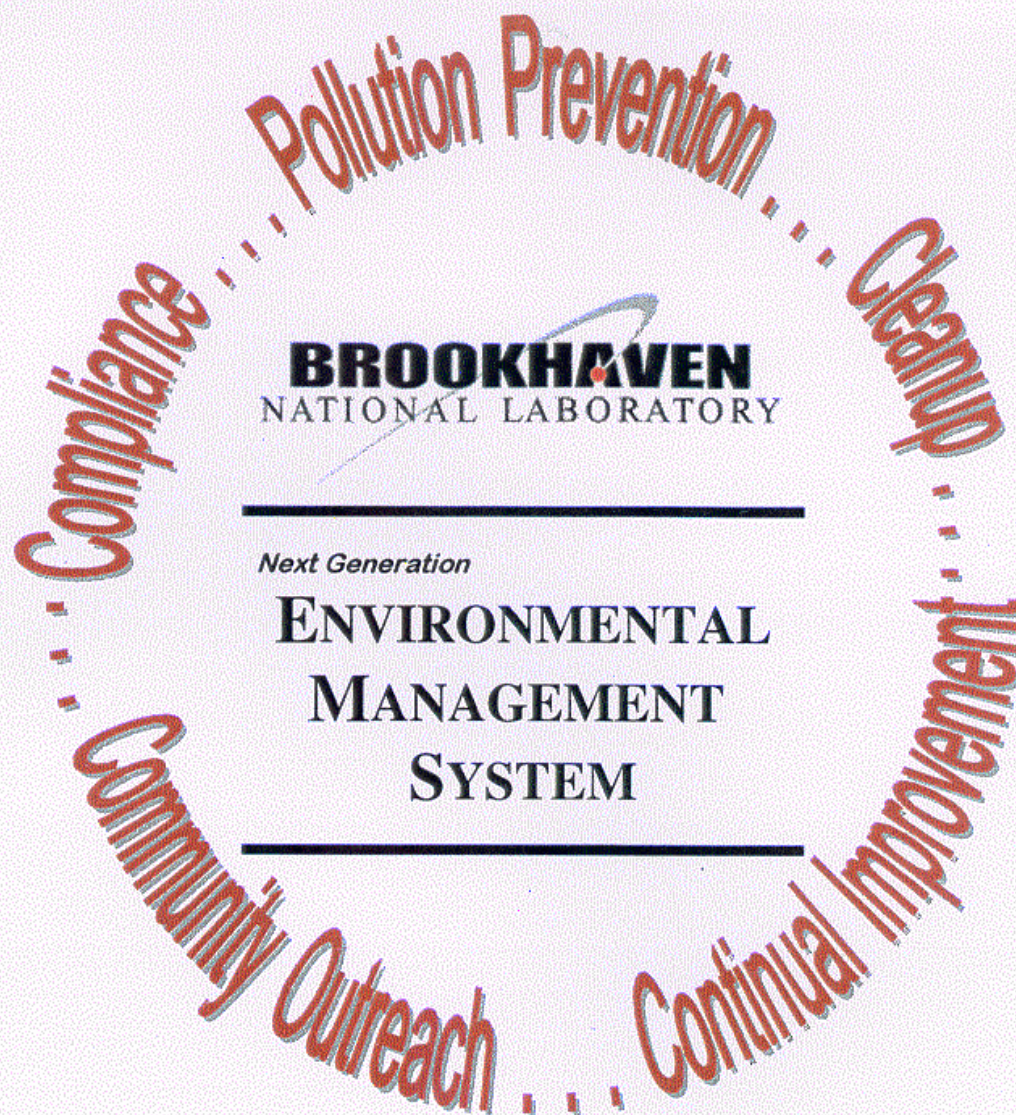
In 1005H Red Strobes and NO Audible Alarm.



A Vapor cloud is observed inside the ODH area or a loud whooshing sound is heard (even if no alarm sounds.)

EVACUATION PROCEDURE

- Leave the area, moving away from any vapor cloud (lethal freezing hazard) or any noise.
- Stay Low! (for He)
 - Duck under magnets to get to exits.
 - Do not use overpasses to cross the beamlines.
 - Do not use vertical (ladder) exits.
 - Use only horizontal exits.
- Call 2222 or 911 if anyone is injured or trapped.
- DO NOT ATTEMPT A RESCUE as you are likely to be the next victim! Let the pros handle it.



PROJECT MANAGEMENT PLAN

REVISION 1, 9/99

ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

- **Compliance** Comply with all applicable environmental requirements
- **Pollution Prevention** Strive to prevent pollution, minimize wastes and conserve resources.
- **Clean Up** Aggressively correct and clean up existing environmental problems.
- **Continual Improvement** Protect our ecosystem and community by continually improving the way we manage our programs.
- **Community Outreach** Openly communicate our progress and performance to our community and stakeholders.

Environmental Responsibilities

The goals of the Environmental Management System are to ensure that:

- You know and comply with environmental regulations associated with your work.
- You know the potential environmental aspects and impacts associated with your work and how to prevent, respond and mitigate impacts.
- You strive to practice the techniques of pollution prevention and waste minimization.

SPILLS

- The C-A is mandated to report spills should that be necessary
- The C-A must always report quickly to outside agencies on events that deal with impacting the environment.
- Even minor events such as spilling any amount of oil in an outdoor area may require reporting.
- If you spill any liquid, indoors or outdoors, THEN contact the C-A Main Control Room, The C-A ESH&Q Division Head or C-A Environmental Coordinator (x 7520) as soon as you can. DO NOT leave a message on an answering machine.
- If you cannot contact the above personnel, Then call 2222 or 911. Report the spill giving your name plus information on the location of the spill and the type of material involved.

WASTE DISPOSAL

Improper disposal of radioactive waste or hazardous waste may result in fines, criminal prosecution, and facility shutdown. Contact the C-A Environmental Coordinator (x 7520) prior to establishing any airborne, liquid, or solid radioactive or hazardous waste stream. The C-A Environmental Coordinator is familiar with rules, permits, authorizations and analysis requirements necessary for proper disposal.

WHAT IS A STOP-WORK ORDER FOR ANY CONDITION?

A knowledgeable person may Stop Work if they perceive that an imminent danger exists. Something that requires immediate action, because death, serious injury, impact to the environment, or significant damage may result.

If an imminent danger is observed state:

“Stop Work! You are in imminent danger because....”

Radiological Stop Work for POOR PRACTICE is for poor performance or regulatory non-compliance, not imminent danger.

STOP WORK POLICY

Person receiving the order imminent danger:

- Shall Obey
- Not Argue and provide supervisor's name

Person delivering the order:

- Must carry out order safely
- Report to Supervisor and ES&H Coordinator
- Do not interfere if SWO is not obeyed

THERE WILL BE NO REPRISAL BY MANAGEMENT
FOR MISTAKEN ORDER

Department Chair gives permission to restart work.

EXAMPLES OF IMMINENT DANGER

- Work which may result in uncontrolled release of toxic, radioactive, or flammable liquids.
- Failure to comply with radiation control or security barrier
- Unsecured compressed gas cylinders or heavy equipment on a moving vehicle
- Work in confined space without following confined space entry requirements.
- Working on energized electrical systems without proper hot - work controls.
- Heat source near combustible materials.

EXAMPLES OF IMMINENT DANGER

- Defeating interlock systems.
- Defeating Access Control Systems.
- Violating C-A Accelerator Safety Envelope (OPM 2.5)
- Defeating ODH, Fire, Gas, or other warning systems.
- Work in High Radiation Area without RWP
- Blatant or repeated disregard of requirements or direction from a RCT.
- Inadequate work controls evidenced by:

Unplanned exposure beyond established limits

Skin contaminations beyond established limits

EXAMPLES OF RADIOLOGICAL POOR PRACTICES

- Entry into controlled Area without proper training or escort.
- TLD worn on the wrong part of the body
- Removal of material without observing exit survey requirements from a location controlled as a Contamination or Radioactive Materials Area.
- Disturbance of radiological postings or barriers.
- Survey for radioactivity performed in a hasty manner.

COMPRESSED GAS CYLINDER HANDLING

GENERAL RULES FOR CYLINDER HANDLING

- Do not drop cylinders or permit them to violently strike each other
- Do not roll cylinders in a horizontal position
- Do not drag cylinders
- Do not handle cylinders with oily hands or gloves (This is especially important when handling oxygen and other oxidizers)
- If hoisting is necessary, use a suitable cradle or platform
- Do not lift cylinder by its cap
- Keep cylinder caps on the cylinder whenever they are not in use
- Transport cylinders using a cart or hand truck designed for that purpose
- Whenever placing a cylinder in service, check the hydrostatic test date
- Tear off the bottom of the Cylinder Status Tag and write the name of assigned users on tag indicating the cylinder is in use.

COMPRESSED GAS CYLINDER STORAGE

- Group Gas by Type, Separate Flammable from Oxidizers
- Empty Cylinders are to be Separate from Full
- Use approve carts for moving cylinders
- Secure cylinders to a permanent fixture or support.



SUMMARY OF ALARM SIGNALS

Response to Continuous/Intermittent Fire Alarm Bell

Exit the area, report to the assembly area.

Response to Flammable Gas/Evacuate Alarm

At the COLLIDER two tone horn and yellow strobe

At the ACCELERATOR pulsating klaxon

Response to an ODH Alarm

Evacuate the area immediately report to outside assembly area.

Wait for further instructions from Fire Captain or ES&H Coordinator

Response to Orange strobe or the overhead lights dim

CRASH the machine.

ASSEMBLY AREA POSTING

EMERGENCY INFORMATION

YOU ARE IN BUILDING # 911

EVACUATION ZONE # 8

IN THE EVENT THE BUILDING ALARM SOUNDS - PROCEED TO
OUTDOOR ASSEMBLY AREA East Parking Lot

IN THE EVENT THE STEADY SITE SIRENS SOUNDS - PROCEED TO
INDOOR ASSEMBLY AREA Main Lobby / Snyder Seminar
room.

SHELTER-IN-PLACE AREA Snyder Seminar Room.

LOCAL EMERGENCY COORDINATOR

A. Piper

EXTENSION 7934

C:\DOCS\EMERG\PLA\GENERAL.SIN

BNL SITE SIRENS

Continuous site-wide siren for five minutes, then leave the area and go to assembly area.

If you hear a pulsating site - wide siren, then evacuate the BNL site.

ACTIONS FOLLOWING AN EMERGENCY ILLNESS / INJURY

- If there is an emergency such as an illness or injury pull the fire pull box and call 911 or 2222.
- If you are injured, then report as soon as possible to the BNL Occupational Medicine Clinic, which is located in building 490.

IF YOU WORK IN A PRIMARY AREA

MAKE A MENTAL NOTE OF YOUR SURROUNDINGS

- Exits
- Fire Alarm Pull Boxes
- Crash Cords / Buttons
- Intercoms / Telephones
- Emergency exhaust
- Radiation Levels
- Conventional Safety Hazards
- Safety Equipment

STAFFING LEVELS AND SAFETY

Rules shall be followed even when you are short-handed. Do not violate Safety rules to get the job done. Do not use a procedure that you have not been trained on although you feel it will please your supervisor. In short, there are no economics for safety.

